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**\*UPDATE\* Oct. 19, 2007 –  
State Issues Water Shortage  
Warning for Harlan, Letcher  
and Pike counties. (To view  
press release please [click  
here.](#))**

[Water Shortage Notification System Explained](#)

[Water Shortage Response Status](#) of known public water  
systems reported to the Division of Water.

**Statewide Summary of Drought  
Development**

 **Updated Oct. 16, 2007** 

The most recent drought indices (Palmer Drought Severity Index and Drought Monitor) indicate deepening of drought conditions across the east and areas along the southern tier of Kentucky. There will be some significant relief by next week in the form of cooler temperatures and increased occurrences of scattered precipitation. However, all citizens should remain prepared to contribute to water use reduction given the severity of the drought and the possibility for less than normal precipitation this winter.

Water supplies on large rivers and reservoirs are capable of sustaining normal water use demands under some very extreme drought conditions. While taste and odor problems can emerge under conditions of hot and dry weather, these sources can

provide assurance against a complete loss of water supply. Other sources are more vulnerable to drought, especially where water use demands are high relative to the drought flows of streams or storage volumes of small lakes. Also vulnerable to extended periods of drought are water supplies that rely on wells in small contained aquifers, abandoned mineworks or springs fed by small drainage basins.

A 66-county water shortage watch area remains in effect for Kentucky. Within this watch area, heightened concern is placed on the counties in southeastern and southcentral Kentucky. This region is one of the hardest-hit areas of the state in terms of rainfall deficits. Citizens in the watch area should be prepared to participate in water conservation efforts should requests be made by their local water supplier.

The Palmer Drought Severity Index issued on Oct. 1, 2007, places the Eastern and Western climatic divisions in extreme drought status (-4.79 and -4.07, respectively). The Bluegrass and Central climatic divisions (-3.93 and -3.52) are currently in Severe Palmer Drought.

An area in southeastern Kentucky designated as in exceptional drought by the U.S. Drought Monitor is expanding. This group of 19 counties is defined by an upper boundary that includes McCreary, Pulaski, Laurel, Jackson, Lee, Breathitt, Magoffin, Floyd and Pike. The rest of the state is classified as extreme drought with the exception of two small areas. In the east, the counties of Greenup, Boyd, Lawrence, Lewis and Carter are included. While in the west, a 13-county area centered on Muhlenburg County is also included.

The short-term forecast calls for a noticeable change in temperatures and chances for beneficial rains as well. While the need is statewide, the southeastern counties of the state have the greatest need for significant rainfall in terms of stabilizing water supplies and preventing the development of critical water shortage issues. With a longer perspective in mind, the outlook for the remainder of the year appears to favor higher-than-normal temperatures. The signals for precipitation are inconclusive and at best indicate normal rainfall chances through the end of the year. Many small water systems in the headwaters of the Kentucky, Licking and Cumberland rivers are exhibiting signs of diminished water supplies. Rainfall in this region will mitigate these developing problems while providing additional flow to the Kentucky River mainstem, which is the source of drinking water for approximately 700,000 Kentucky citizens.

Hurricanes and tropical storms moving overland from the Gulf of Mexico are also still a possibility. Moisture-laden tropical depressions that move across Kentucky are capable of producing slow-moving and drenching storms that can alleviate significant drought deficits of soil moisture, groundwater levels and flows in rivers and streams. However, hopes for drenching storm systems from remnants of tropical storms should not be a part of our strategy to manage water supplies diminished by drought.

There are currently 35 water systems in Kentucky that have in place some level of water shortage response. Many of these are proactive in nature and are intended to reduce demand for water before a water shortage situation develops. Others are in direct response to immediate concerns with low streamflows or declining levels of water supply reservoirs. Communities of greatest concern are located in the headwaters of the Kentucky, Licking and Cumberland rivers that rely on small streams or abandoned underground mine works or wells. Other water supplies that

rely on small lakes and reservoirs are seeing significant drawdown of their storage, but as a general rule no immediate concerns for water shortages have been reported by this sector of water supplies.

October is historically the driest month of the year in Kentucky. However, a return to more seasonal temperatures can be of some benefit by reducing the demand for water from our rivers, lakes and groundwater. Beneficial rains may make their way into Kentucky over the next two days, further easing some of the discomfort of hot, dry weather. Please remember that it is important for all Kentuckians to comply as fully as possible with any requests made by their water suppliers to help conserve water.

## **Useful Drought Indicators**

### **PRECIPITATION**

For the year, precipitation deficits for Kentucky range from 61 percent of normal in the Eastern climatic division to 74 percent of normal in the Central and Bluegrass climatic divisions. Precipitation in the Western, Central, Bluegrass and Eastern climatic divisions for the previous 30-day period averaged 43, 32, 49 and 47 percent of normal, respectively.

### **STREAMFLOWS**

With the continued lack of precipitation, streamflows across the state continue to decline. About half of the real-time stream gauging network is currently below a normal range for this time of year (less than a 25 percentile flow). Approximately, 30 percent of the gauges are now classified as much below-normal (less than a 10 percentile flow).

### **LAKE ELEVATIONS**

Several small water supply lakes are now approaching abnormally low levels, and they will continue to decline with the precipitation deficit. Customer demand has forced a number of these water systems to call for conservation measures. Most lakes under the control of the [Huntington District](#), [Louisville District](#) and [Nashville District](#) of the U.S. Army Corps of Engineers are currently below the normal summer pool elevation with most in the initial stages of drawdown to winter pool. Taylorsville Lake in Spencer County is currently below winter pool elevation. The first week of September, the U.S. Army Corps of Engineers began an early lowering of Rough River Lake to allow for repairs. Releases from Corps of Engineers reservoirs are important to the status of many Kentucky rivers as sources of supply for drinking water, assimilation of wastewater discharges, water quality and aquatic habitat. These rivers include the Green, Barren, Rough, Nolin, Kentucky, Salt, Licking and Big Sandy rivers.

### **DROUGHT INDICES**

Assessing the severity of a drought is made easier with the use of drought indices that combine various source information into a single representative value of drought

severity. The [Palmer Drought Severity Index](#) uses data for precipitation, temperature and evapotranspiration (the water returned to the atmosphere through the combined actions of evaporation and plant growth) to calculate a number that can be compared across different times and locations. This index was developed in the 1960's in Kansas and Nebraska but has since become a part of drought monitoring in a majority of the United States. The Palmer Drought Severity Index is updated weekly on Monday afternoons.

The [Drought Monitor](#) represents a comprehensive assessment of several factors that contribute to the development of drought or that indicate the severity and potential persistence of drought. The Drought Monitor is updated weekly on Thursday mornings.

### **Updated Oct. 16, 2007**

The Palmer Drought Severity Index and the Drought Monitor indicate severe to extreme drought across Kentucky with the Drought Monitor having the southeastern corner of the state to exceptional.

The Palmer Drought Severity Index issued on Oct. 15, 2007, places the Eastern, Bluegrass and Western climatic divisions in extreme drought status (-4.95, -4.24 and -4.29, respectively). The Central climatic division (-3.94) remains in Severe Palmer Drought.

It is important to note that the Palmer Drought Severity Index is used as a general index of drought over large geographic areas defined by the four climatic divisions of Kentucky. Rainfall that affects one part of a climatic division may substantially improve drought conditions on a county or multi-county level but have little or no impact on the regional average conditions defined by the Palmer Index.

### **Updated Oct. 16, 2007**

An area in southeastern Kentucky designated as in exceptional drought by the U.S. Drought Monitor remains unchanged. This group of 19 counties is defined by an upper boundary that includes McCreary, Pulaski, Laurel, Jackson, Lee, Breathitt, Magoffin, Floyd and Pike. A new area of exceptional drought is pushing into the state along the Tennessee border between Christian and Simpson counties. The rest of the state is classified as extreme drought with the exception of a small area along northern Ballard, McCracken and Livingston counties.

As a drought indicator, the Drought Monitor is not limited to four large climatic divisions, rather it incorporates the Palmer Index as just one of several indicators of drought development in a given area. These other indicators include more short-term components including the Crop Moisture Index, Standardized Precipitation Index and weekly streamflow percentiles. The Palmer Drought Severity Index and the Drought Monitor should be considered in combination with more localized data

such as rainfall, streamflows, groundwater levels and climatic outlooks to form an accurate assessment of drought severity in a given location.

## **Drought Monitoring**

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Drought is a natural and recurring feature of our climate that can be considered a "severe" weather event much like a tornado, a flood or a hurricane. However, there are a few key differences that distinguish drought from other weather events that make it difficult to detect, track and respond to drought.

Part of the difficulty in detecting drought is in the lack of an obvious onset of drought conditions. A drought develops slowly and can appear to mimic a normal spell of dry weather in the summer, a time of the year when dry weather is accepted and expected. Short-term rainfall shortages create problems for agricultural crops, livestock, urban landscapes and other activities that depend on stored soil moisture between rainfall events. We are accustomed to dealing with short-term dry spells in part because there is an expectation that rainfall is just around the corner. However, when rainfall shortages persist for weeks or months at a time, activities that depend on long-term storage of water will be adversely impacted as well. Droughts in Kentucky can have serious negative consequences for drinking water supplies, energy production, commercial and industrial operations, recreation and aquatic habitat.

The negative impacts of drought cannot be avoided but there are ways to reduce them to a manageable level. All water suppliers in the commonwealth should have a water shortage response plan to guide both the supplier and customer during a drought event. It is important for customers to listen to their water suppliers and be ready to take necessary actions to prevent a water shortage problem from developing. This is critical to a successful outcome because the only way to effectively manage the source of water supply is to first manage the demand for water.

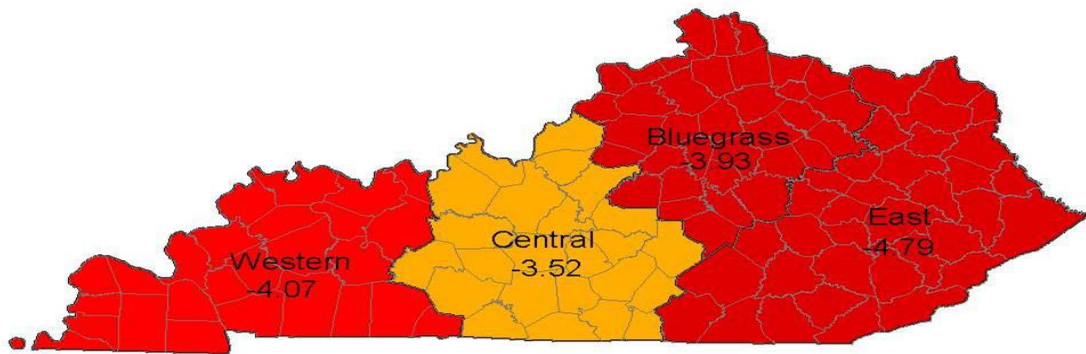
There is no easy method for determining when a dry spell has become a drought, how long a drought will persist or how intense a drought may become. However, by closely tracking certain sources of information, referred to as drought indicators, it is possible to detect potential drought development early enough to allow at least some lead-time for notification and initiation of drought response preparations at the local level. The Division of Water monitors for the potential development of drought in Kentucky by tracking precipitation, streamflows, lake levels, groundwater and water supplies. There are also several tools that are useful in assessing the severity of a "dry spell" and the potential impacts to agriculture, forest fires, water supplies and other vulnerabilities to drought. These tools include the Palmer Drought Severity Index, the Drought Monitor, the Standardized Precipitation Index and several others.

The Drought Monitoring pages will be updated on a weekly basis to provide timely information and assessments of current drought conditions in Kentucky. There will also be numerous links to other resources and drought information pages from various state and federal agencies.

**Updated Oct. 4, 2007**

**Palmer Drought Severity Index** The Palmer Drought Severity Index (PDSI) is compiled weekly by the Central Region Climate Prediction Center (National Centers for Environmental Prediction, National Weather Service and National Oceanic and Atmosphere Administration) and provided on the University of Kentucky Agricultural Weather Center's Web site. This index is useful for placing a developing drought into context with past droughts and serves as a measure of current conditions. The index also provides a standardized assessment of developing drought conditions that can be compared between different areas of the state or even between different states.

PDSI values can be categorized as follows:



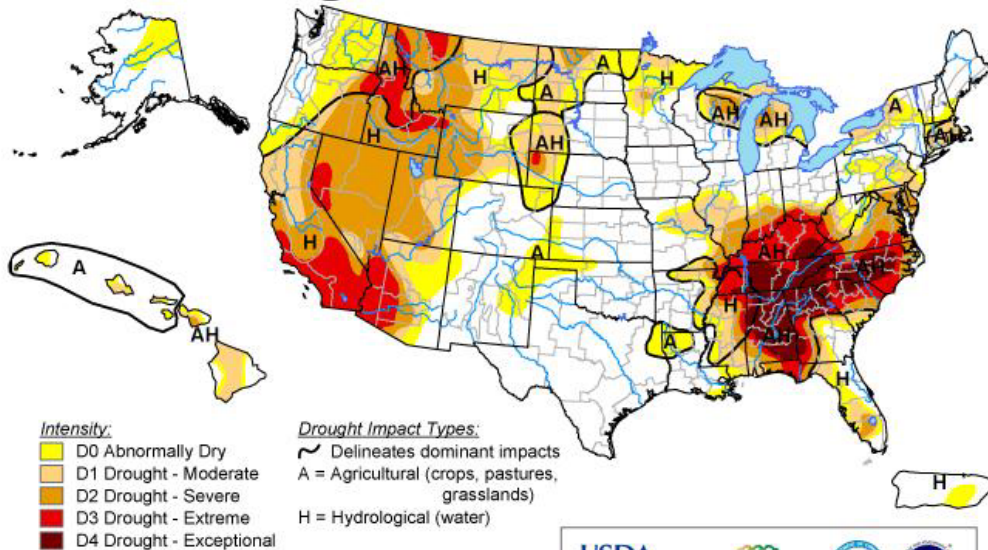
- 0 to -0.99 = near normal
- -1.00 to -1.99 = mild drought
- -2.00 to -2.99 = moderate drought
- -3.00 to -3.99 = severe drought
- -4.00 and below = extreme drought

**The Drought Monitor**



# U.S. Drought Monitor

October 16, 2007  
Valid 8 a.m. EDT



The Drought Monitor focuses on broad-scale conditions.  
Local conditions may vary. See accompanying text summary  
for forecast statements.

<http://drought.unl.edu/dm>



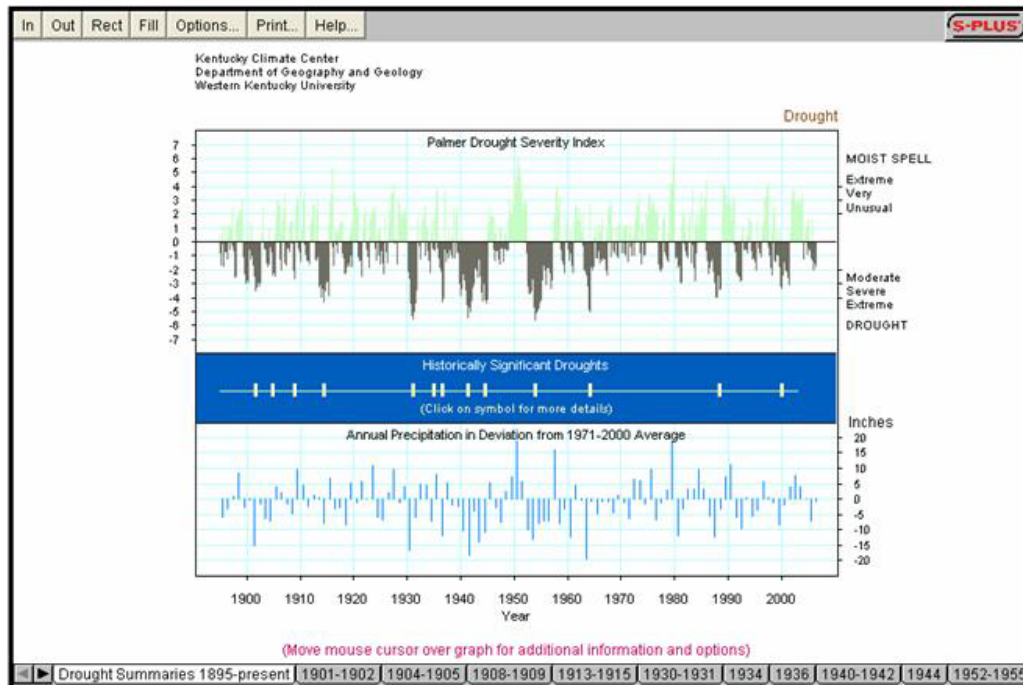
Released Thursday, October 18, 2007

Author: Mark Svoboda, National Drought Mitigation Center

Tracking drought blends science and art. No single definition of drought works for all circumstances, so people rely on drought indices to detect and measure droughts. But no single index works under all circumstances, either. The Drought Monitor is a synthesis of multiple indices, outlooks and news accounts, that represents a consensus of federal and academic scientists. A detailed description of the parameters used to create the Drought Monitor can be found [here](#).

[Kentucky Climate Center](#) Historical Drought Data





Interactive graphs displaying drought indices since 1895 for Kentucky's four climate divisions. Users can identify and explore the development of historically significant droughts.

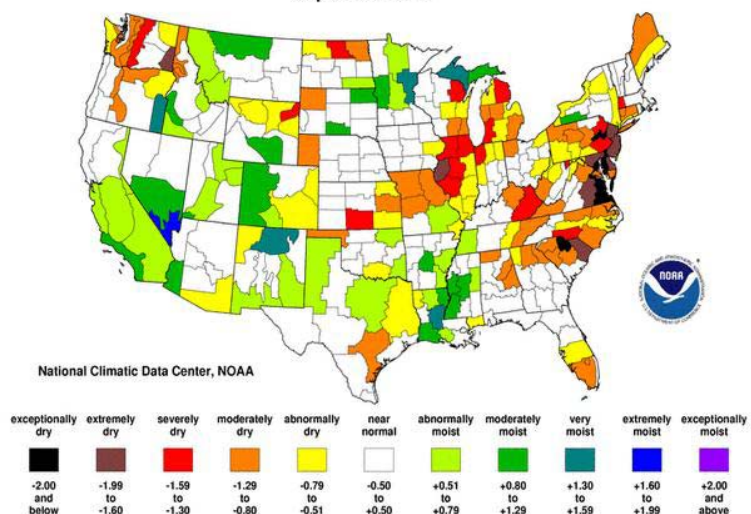
Examining the past can be a useful tool in interpreting the significance of a developing drought situation. Comparisons of the current drought to the historical record provide a frame of reference for evaluating how serious the current drought has become, and how it might develop in the coming months. One of the best tools to evaluate past droughts is found at the Kentucky Climate Center at Western Kentucky University. Click on the figure at the left to visit this site and learn more about the history of drought in Kentucky.

### **[The Standardized Precipitation Index](#)**

The Standardized Precipitation Index (SPI) is a way of measuring drought that is different from the PDSI. Like the PDSI, this index is negative for drought and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

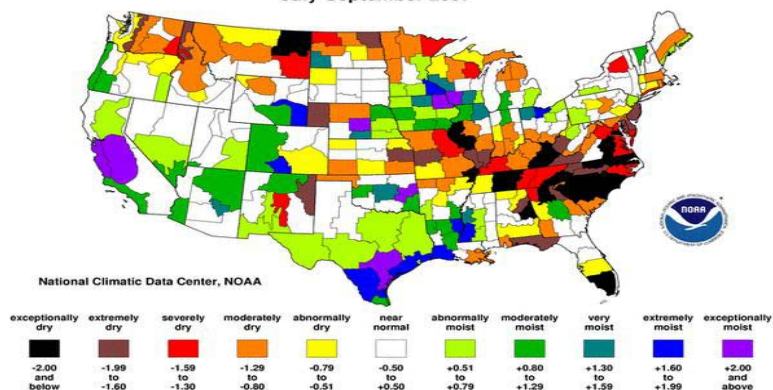
# Standardized Precipitation Index One Month

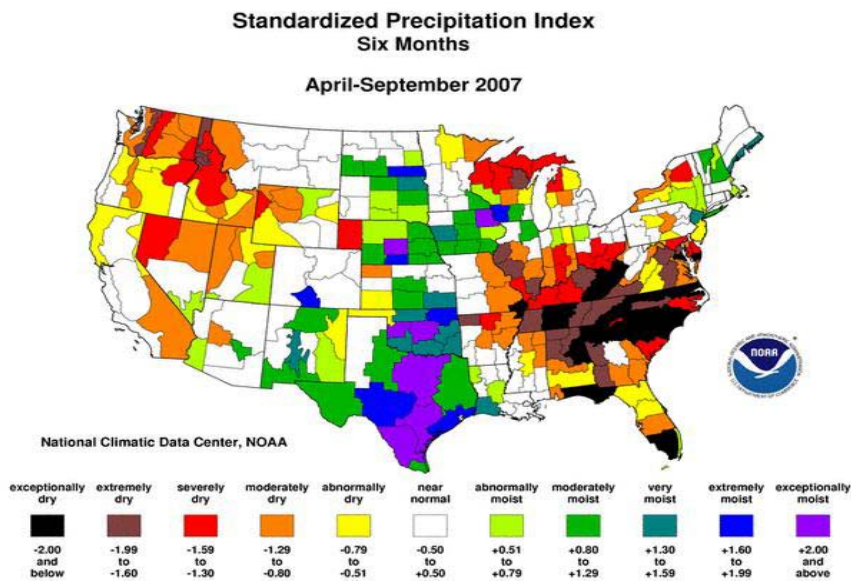
September 2007



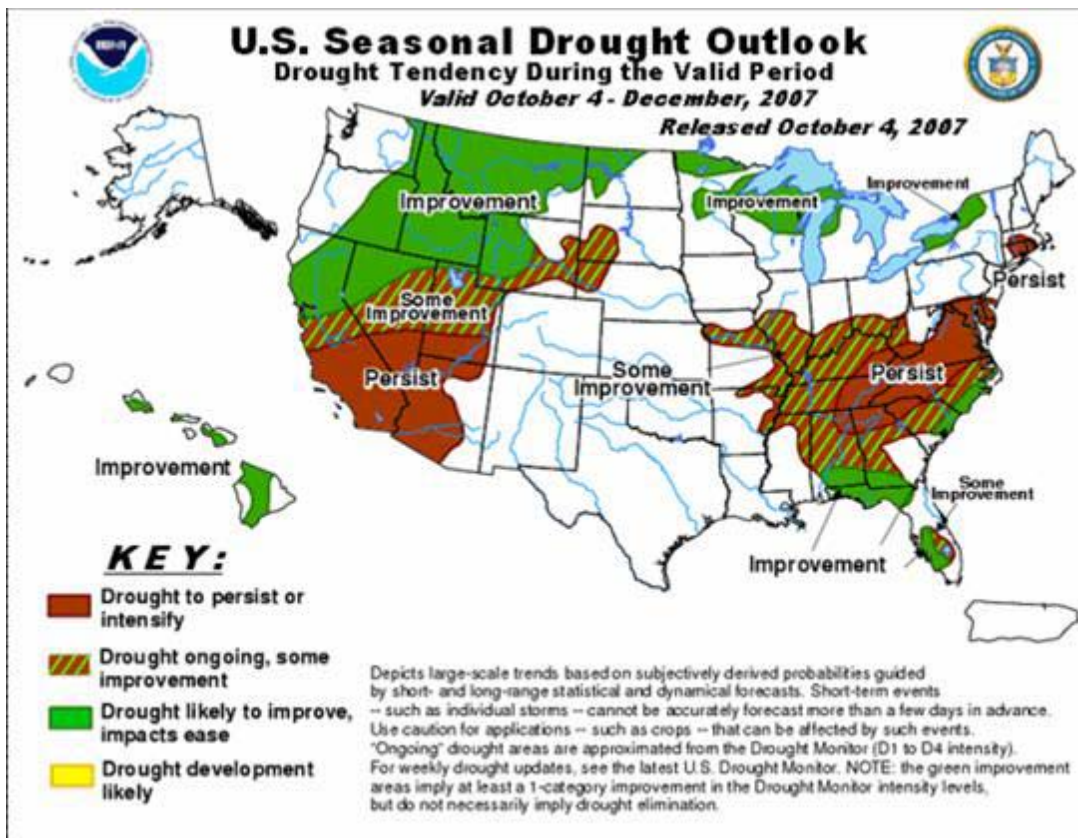
# Standardized Precipitation Index Three Months

July-September 2007





## U.S. Seasonal Drought Outlook



The Climate Predication Center issues the U.S. Seasonal Drought Outlook each month in conjunction with the release of the long-lead temperature and precipitation outlooks.

## **Weather and Climate**

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# **PRECIPITATION**

The Division of Water monitors a network of 24 daily climate-reporting stations to track developing shortages of precipitation. For the year, precipitation deficits for Kentucky range from 61 percent of normal in the Eastern climatic division to 74 percent of normal in the Central and Bluegrass climatic divisions.

 **Updated Oct. 16, 2007** 

(Click on images to enlarge)

**Precipitation: Data for the previous 30/60/90-day period and the Water Year Beginning October 01, 2006**

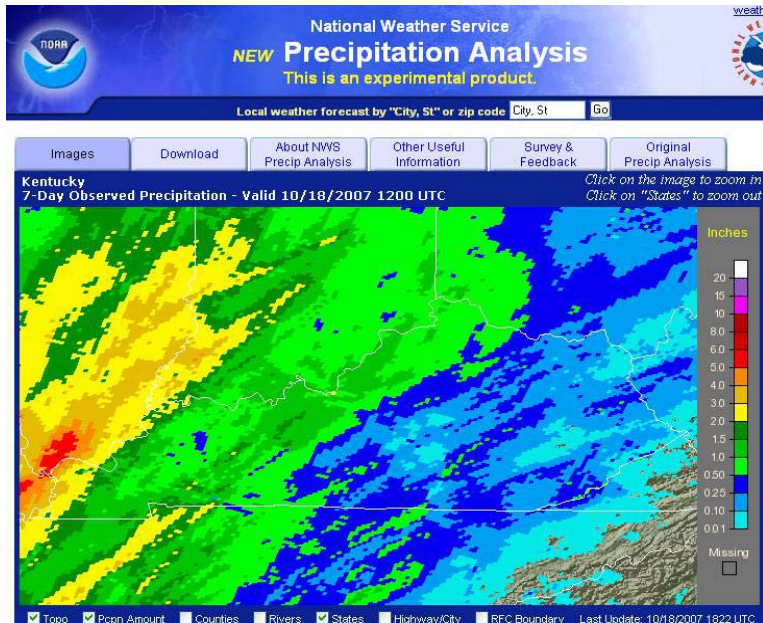
Station	Water Year		30/60/90 Day Total Precipitation and Departure From Normal					
	Precipitation Totals (inches)	Departure From Normal (inches)	30 Day Total (inches)	30 Day Departure (inches)	60 Day Total (inches)	60 Day Departure (inches)	90 Day Total (inches)	90 Day Departure (inches)
Henderson	32.27	1.35	1.29	-3.28	5.88	-2.85	9.26	-4.06
Paducah	33.68	-1.04	2.32	-2.63	5.75	-4.04	8.72	-5.87
Princeton	30.11	-6.18	2.05	-2.88	5.96	-3.64	8.32	-6.07
Mayfield	27.58	-10.52	0.60	-4.16	3.85	-5.93	5.75	-9.21
Louisville	30.34	0.04	1.19	-3.26	6.33	-2.39	9.31	-3.87
Bardstown	27.05	-2.41	0.61	-3.84	5.24	-3.16	8.62	-3.98
Hardinsburg	29.47	-4.05	1.24	-3.48	5.51	-3.58	7.82	-5.70
Campbellsville	29.07	-6.24	1.69	-3.51	7.53	-2.45	11.86	-2.88
Nolin Lake	30.33	-5.12	3.35	-1.90	8.12	-1.79	10.49	-3.60
Glasgow	27.72	-8.33	1.38	-3.63	6.30	-3.32	9.49	-4.98
Bowling Green	25.25	-10.23	2.58	-2.26	6.60	-2.63	7.55	-6.52
Covington	24.60	-3.06	0.92	-3.31	3.46	-4.58	6.07	-6.02
Williamstown	32.10	2.93	1.80	-2.53	5.99	-2.51	12.43	-0.56
Spindletop	21.72	-7.66	1.30	-3.07	4.69	-3.63	7.17	-5.35
Lexington	26.89	-2.48	2.22	-2.14	5.96	-2.35	8.75	-3.76
Dix Dam	24.47	-6.36	1.26	-3.38	5.62	-3.30	9.45	-3.70
Berea	24.11	-6.60	1.49	-3.28	5.69	-3.41	9.30	-3.93
Grayson	24.78	-2.65	1.82	-2.06	5.34	-2.71	8.35	-3.19
Jackson	21.76	-9.63	1.88	-2.52	4.27	-4.27	5.67	-7.06
Quicksand	20.38	-11.12	1.87	-2.65	4.21	-4.45	5.60	-7.24
Buckhorn Lake	18.13	-12.27	0.63	-3.51	3.84	-4.09	6.00	-6.04
London	21.97	-9.18	0.96	-3.29	5.88	-2.32	6.66	-5.77
Somerset	26.75	-7.78	1.30	-3.80	5.31	-4.23	7.63	-6.30
Cumberland Gap	20.80	-14.40	0.30	-4.44	4.62	-4.30	7.75	-5.93

Climatic Division	Normal Precip. Water Year	Normal Precip. Calendar Year	Percent of Normal Precipitation				
			Water Year	Calendar Year	30 Day	60 Day	90 Day
Western (1)	1.10	38.46	9	68	43	57	52
Central (2)	1.05	38.94	13	74	32	61	64
Bluegrass (3)	0.98	35.31	16	74	49	51	65
Eastern (4)	1.06	37.25	22	61	47	48	58

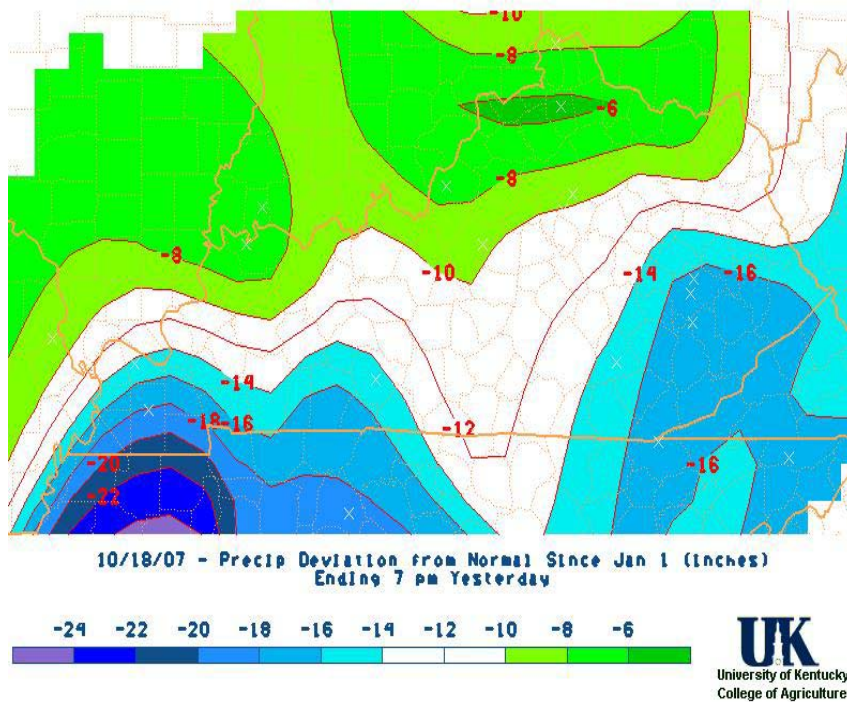
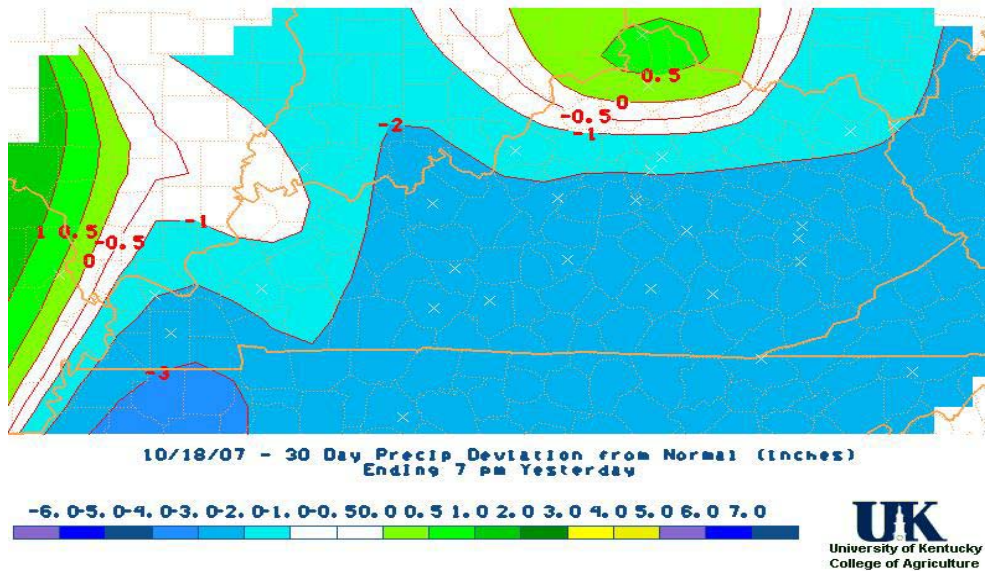
Showers today provided only trace precipitation for much of the state with areas in the north receiving one-half inch or more. Rainfall totals for the previous 30-day period have been very poor. Precipitation in the Western, Central, Bluegrass and Eastern climatic divisions averaged 43, 32, 49 and 47 percent of normal, respectively.



Statewide, the combined precipitation for the months of January through September of this year ranked as the third driest for the period since at least 1895 -- the first year of the instrumental record. When the record is truncated to March through September, average annual precipitation for the state ranks as the second driest of the record.

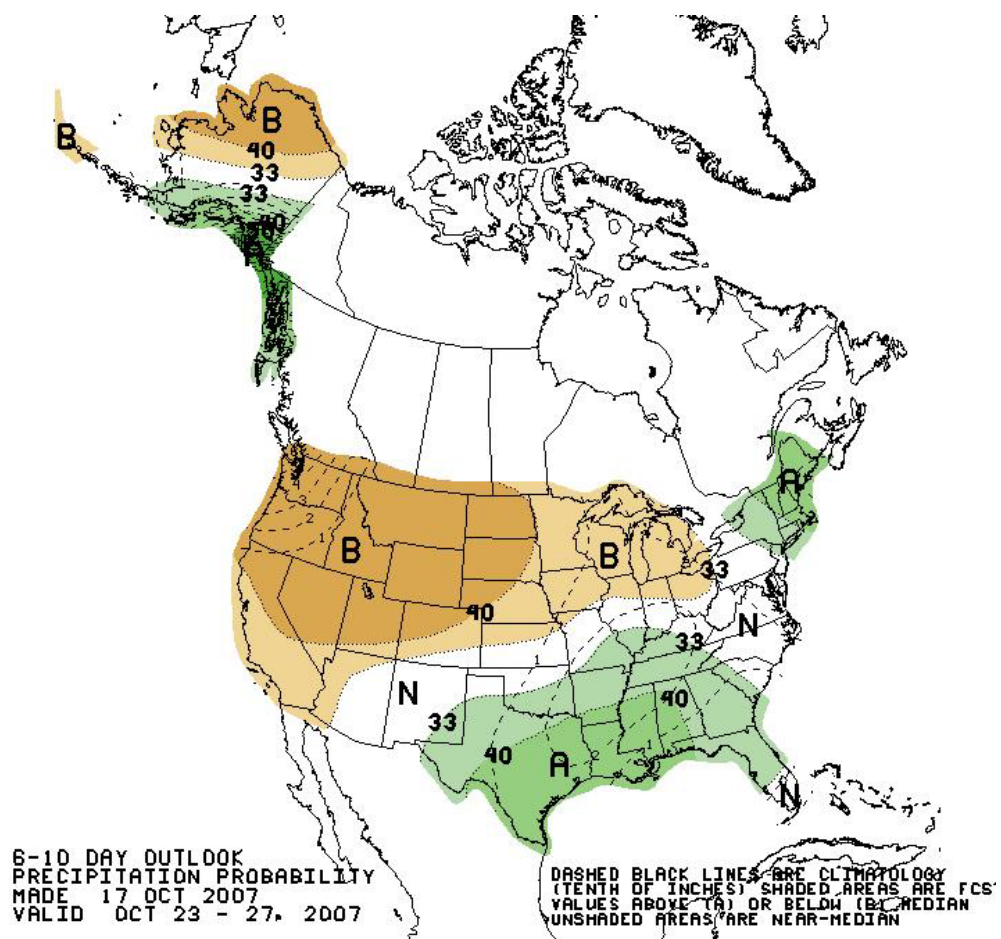


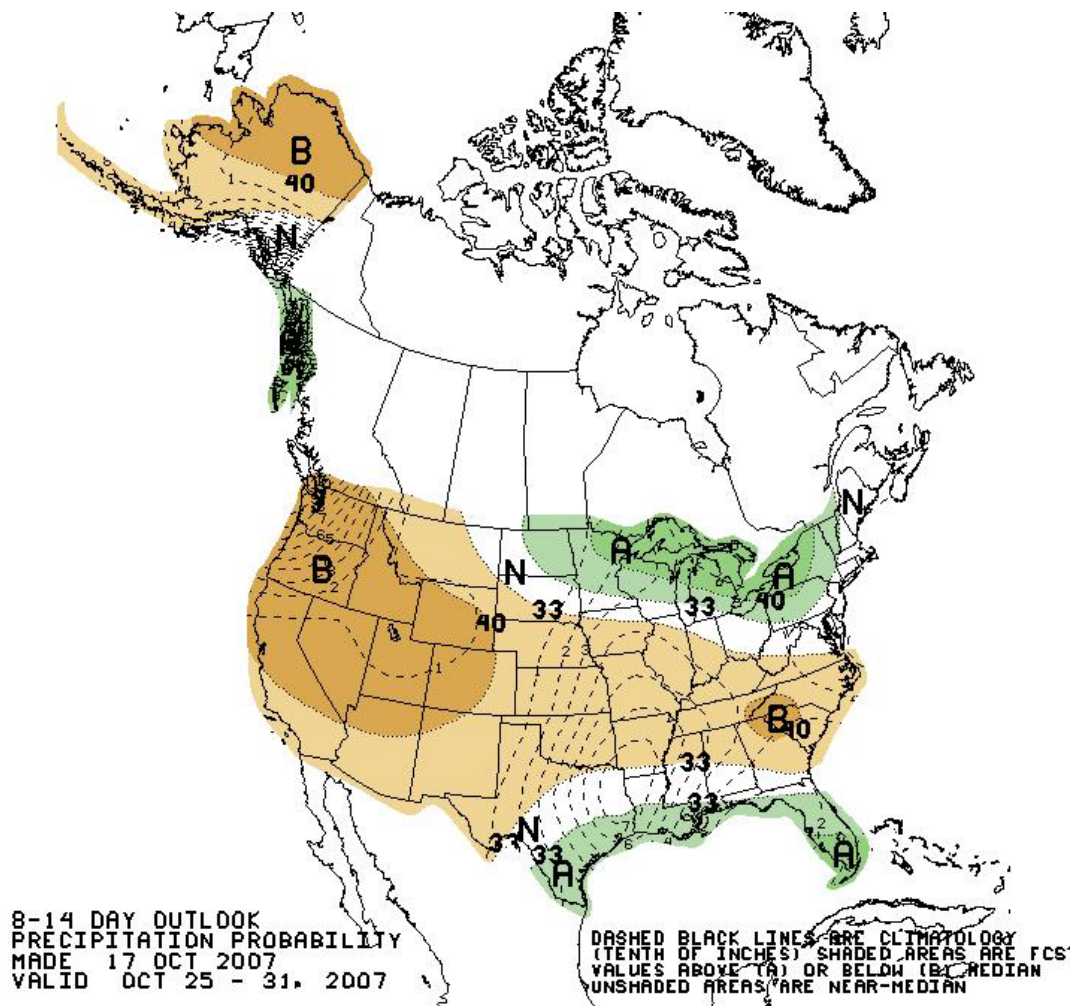
**ATTENTION:** One of the best tools to assess the amount and distribution of precipitation in Kentucky is the National Weather Service's [Precipitation Analysis Product](#). Data can be displayed for many different time frames and can be selected to show not only the amounts, but also the deficits and percentages of normal for each time frame.



For the year, the largest deficits remain in the southern portions of the Western and Eastern climatic divisions. Ten to 20-inch precipitation deficits have built in parts of the Purchase area of the west. Deficits in the headwaters of the Kentucky, Licking, Cumberland and Big Sandy river basins in the east have reached 12 to 18 inches for the year. Deficits range from 1 to 16 inches in the Bluegrass and parts of south-central Kentucky.







The six- to 10-day short-term outlook from the Climate Prediction Center indicates a slight chance for above-normal precipitation in the eastern Kentucky and equal chances for below-normal, normal and above-normal rainfall for the rest of the state. When expanded to 14 days the outlook is below-normal rainfall for the entire state. One to three month outlooks from the Climate Prediction Center indicate equal chances for below-normal, normal and above-normal rainfall for Kentucky.

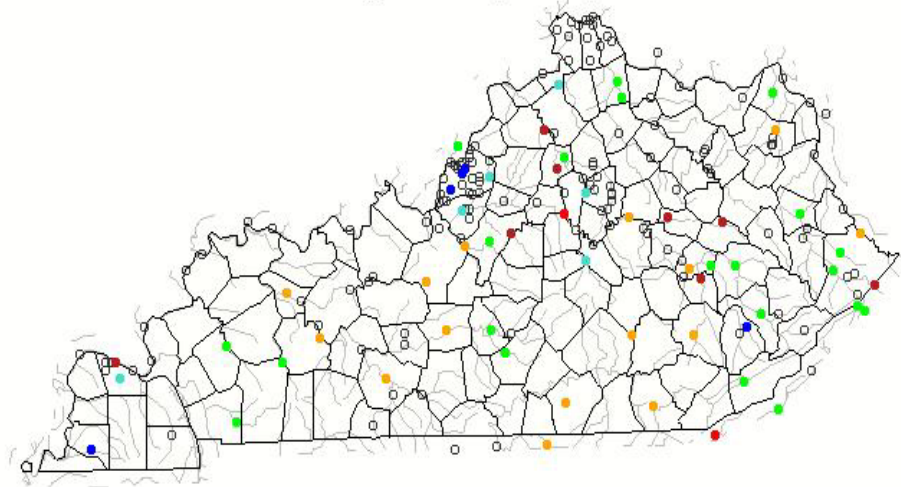
## Hydrology

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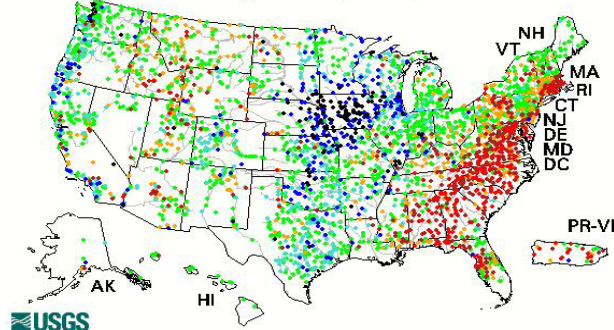
### STREAMFLOWS

The [U.S. Geological Survey](#) maintains a [real-time stream gauging network](#) that monitors flows in all major river basins in Kentucky. Measurements of streamflow are a very good indicator of the longer-term hydrologic impacts of drought. During the developing stages of drought, streamflows provide valuable information on the severity and regional extent of emerging problems. Streamflow data is evaluated relative to the long-term record to determine drought intensity and identify potential problems associated with water shortages. Once a drought has matured, streamflow measurements are critical at many locations where water withdrawals have the potential to cause adverse environmental impacts to streams.

Thursday, October 18, 2007 14:30ET



Thursday, October 18, 2007 14:30ET



 Updated Oct. 16, 2007 

With the continued lack of precipitation, streamflows across the state continue to decline. About half of the real-time stream gauging network is currently below a normal range for this time of year (less than a 25 percentile flow). Approximately, 30 percent of the gauges are now classified as much below-normal (less than a 10 percentile flow).

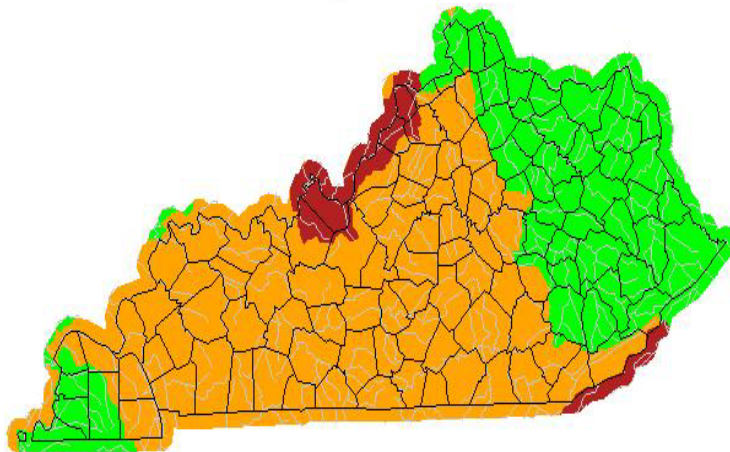
## Weekly and Monthly Streamflow

For a slightly longer-term perspective of streamflow conditions across Kentucky, the United States Geological Survey computes average flows for the previous seven, 14 and 28 days. The resulting average streamflow values are categorized relative to the long-term record and assigned levels of severity based on the frequency that similar magnitudes of low-flow have occurred in the past. By averaging over a period of several days to several weeks, the values on the map are more indicative of longer-term conditions than daily average or real-time streamflow measurements.

**Updated Oct. 16, 2007**

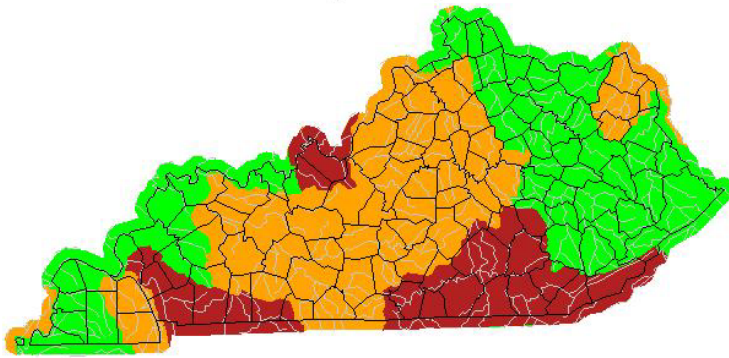
### Seven-Day Average Streamflow

Wednesday, October 17, 2007



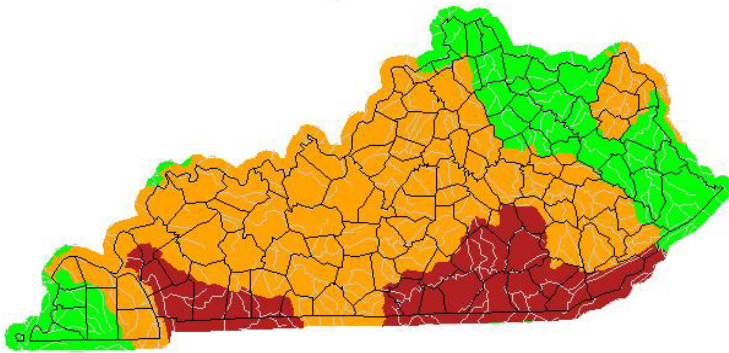
### 14-Day Average Streamflow

Wednesday, October 17, 2007



### 28-Day Average Streamflow

Wednesday, October 17, 2007



The 28-day average streamflow indicates that flows are significantly below-normal in the Upper and Lower Cumberland River basins. Elsewhere, long-term flows are below-normal in the Licking, Kentucky, Tennessee, Salt, eastern Green and Little Sandy river basins. Flows in the Big Sandy, Tradewater, western and southern Green river basins, along the Ohio River in the north and in the western Purchase area are within a normal range.

## Lakes and Reservoirs U.S. Army Corps of Engineers Projects

Another useful measure of the impact that drought is having on a region is the status of area lakes and reservoirs. The Division of Water monitors data from 12 projects operated by the U.S. Army Corps of Engineers (USACE) from three USACE districts: [Louisville](#), [Huntington](#) and [Nashville](#). These projects strive to maintain reservoirs at pool levels consistent with the operating guidelines as part of the larger mission of flood control and navigation in the Ohio and Mississippi rivers. Beginning in April, the releases from the reservoirs are managed to allow filling to the "normal summer pool elevation." Significant precipitation deficits in the basin above the reservoir can



adversely affect the attainment of normal summer pool elevation. This, in turn, may result in low flows in the river below the project when releases from the reservoir are reduced to the minimum needed for water quality and aquatic habitat.

By examining the data for "current pool elevation" and "current outflow," valuable information about the status of large headwater areas above the USACE reservoirs can be obtained.

 **Updated Oct. 16, 2007** 

### **United States Army Corps of Engineer Reservoir Information Updated Oct. 16, 2007**

October 16, 2007				
Basin	Project	Current Outflow (cfs)	Normal Summer Pool Elevation (ft)	Current Pool Elevation (ft)
Little Sandy	Grayson	26.2	645	641.4
Big Sandy	Dewey	10.1	650	649.5
	Fishtrap	144.8	757	749.0
	Yatesville	27.0	630	628.4
	Paintsville	12.7	709	708.1
Licking	Cave Run	246.0	730	727.9
Kentucky	Carr Creek	42.0	1027	1023.5
	Buckhorn	39.0	782	778.7
Salt	Taylorsville	32.0	547	543.2
Green	Green River	48.0	675	673.2
	Nolin	521.0	515	512.9
	Barren River	240.0	552	547.3
	Rough River	24.0	495	474.9

Currently, reservoir levels are below the normal summer pool elevation at all Corps lakes with most in the initial stages of drawdown to winter pool. Taylorsville Lake in Spencer County is currently below winter pool elevation. Rough River Lake dropped to winter pool elevation in September to allow for repairs to the stilling basin.

### **Small Lakes and Water Supply Reservoirs**

The Division of Water will monitor selected small water supply reservoirs when conditions indicate that water supplies may be threatened by persistent drought. Several small water-supply lakes are now approaching abnormally low levels and they will continue to decline with the precipitation deficit. Customer demand has forced a number of these water systems to call for conservation measures.